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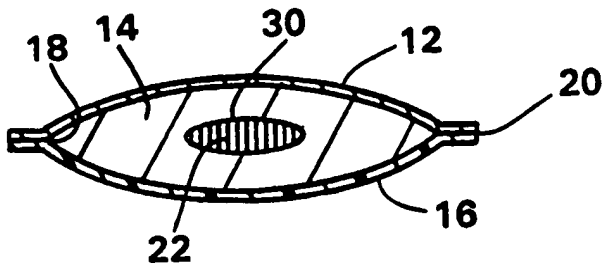
(54) Title: INTERNALLY HEATED ABSORBENT ARTICLE

(57) Abstract

An absorbent article includes a particulate chemical mixture, which is exothermically reactive in the presence of air or moisture, for heating at least a portion of the absorbent article. The heat generated improves the absorption of body fluids by lowering the viscosity of the absorbed fluids.



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INTERNALLY HEATED ABSORBENT ARTICLE

FIELD OF THE INVENTION

The present invention relates generally to an absorbent article and particularly to an absorbent article having a mixture that generates heat when exposed to air and/or moisture.

BACKGROUND OF THE INVENTION

All manner and variety of devices or appliances are configured for absorption of body fluids, such as menses, are well known. Sanitary napkins are the most frequently used of these devices. The prior art is replete with patents relating to protective pads and sanitary napkins for the absorption of body fluids and protecting the undergarment from staining. It has been suggested that from 20-25 percent of all sanitary napkins leak. A contributing factor to the leakage is that menses is a viscous fluid having aqueous and mucus-like components.

A problem in the performance of the absorbent is that the more viscous the material the slower the rate of absorption. Basically, the low viscous materials readily pass through the cover of the sanitary napkin and are absorbed by the absorbent. The higher viscosity materials in the menses may not be absorbed and can remain on the cover. Alternatively, the higher viscosity materials may be absorbed but remain at or near the point of insult occluding absorption of the lower viscosity materials. This limits the effectiveness of the absorbent and the utilization of the absorbent capacity of the sanitary napkin. Moreover, the absorbent may contain superabsorbent materials which preferentially absorb the aqueous constituents from low viscous materials thereby increasing the viscosity of the remaining material. This exacerbates the problem of the absorbent to absorb the viscous components of the menses.

Until now, surfactants have been used to improve the absorption of body fluids. One or more of the materials used in constructing the sanitary napkin, such as the cover and/or absorbent, have been treated to improve the material wetability. The problem of using a surfactant is that the surface energy of the coated material is modified but the surfactant does appreciably modify, if at all, the viscosity of the body fluid. Thus, the higher viscosity materials are still not efficiently absorbed.

Accordingly, there is a need for an absorbent article, such as a sanitary napkin, which can modify the viscosity of a viscous material so that it can be absorbed.

SUMMARY OF THE INVENTION

Briefly, the present invention is an absorbent article adapted for absorbing body fluids. The absorbent article has a cover, a baffle, an absorbent enclosed between the cover and the baffle and a heating means for heating the absorbent. The heating means can, when activated by exposure to air and/or moisture, generate a temperature of from about 22°C to about 55°C.

It is an object of the invention to provide an absorbent article having a heating means for producing heat when activated. It is another object of the invention to provide a sanitary napkin having a heating means within the sanitary napkin that produces heat when activated.

It is another object of the invention to provide a sanitary napkin having a heating means and improved absorbent utilization.

It is another object of the invention to provide a sanitary napkin having a chemical mixture that will generate heat so that the viscosity of the more viscous component of menses can be lowered by heating the fluid.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a top view of one embodiment of the absorbent article of the present invention.

Fig. 2 is a transverse cross-sectional view of Fig. 1 along lines 2--2.

Fig. 3 is a transverse cross-sectional view of an alternative embodiment of the present invention.

Fig. 4 is a transverse cross-sectional view of an alternative embodiment of the present invention.

Fig. 5 is a transverse cross-sectional view of an alternative embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

While the specification concludes with claims particularly pointing out and distinctly claiming that which is regarded as the invention, it is believed that the invention

can be more readily understood with reference to the accompanying drawings of figures in conjunction with the following detailed description of the invention.

Referring to Figs. 1-5 of the drawings, in which like parts are identified with like reference characters, Fig. 1 illustrates a top view of a sanitary napkin 10 in accordance with this invention. As shown in these drawings and viewed from the top, i.e., that side which would normally be placed adjacent to the wearer during use, the sanitary napkin 10 is comprised of a fluid permeable cover 12; an absorbent layer 14 which is shorter and narrower than the cover 12; and a liquid-impervious backing or baffle 16. As seen in Figs. 2-4, the cover 12 and baffle 16 extend beyond an edge 18 of the absorbent 14 to enclose the absorbent 14 and to define the perimeter 20 of the sanitary napkin 10. As used herein "edge" or "edge of the absorbent" are equivalent and encompasses the border at which the absorbent 14 terminates, without limitation to longitudinal sides or transverse ends of the absorbent 14 unless specifically so stated. Although not shown, one skilled in the art would understand that the cover 12, absorbent 14 and baffle 16 can have a coterminous edge, but this is not preferred. The cover 12 and the baffle 16 may be sealed together using any suitable means that will not leave a hard, uncomfortable residue that may be annoying to the wearer. As used herein, the term "sealed" encompasses configurations whereby the cover 12 is directly joined to the baffle 16 or, alternatively, by affixing the cover 12 to an intermediate member, not shown, which may in turn be affixed to the baffle 16. Methods for attaching the cover 12 and the baffle 16 are well known to those skilled in the art and include the use of hot melt adhesive, pressure sensitive adhesive, construction adhesive, double-sided tape, heat sealing and ultrasonic bonding.

As used herein, the term "sanitary napkin" refers to an article which is worn by females adjacent to the pudendal region and which is intended to absorb and contain various exudates which are discharged from the body such as blood, menses, and urine, and which is intended to be discarded when soiled, not laundered and reused. Interlabial devices which reside partially within and partially external of the female wearer's vestibule are also within the scope of this invention.

The sanitary napkin 10 further includes a heating means 22 positioned below the cover 12 and preferably adjacent to the absorbent 14. The heating means 22 can be comprised of one or more cells containing exothermic or electrochemical reactants that will produce heat when activated by oxygen or moisture or can comprise a material that will effectively distribute heat from the wearer's own body. Desirably, the heating means 22 lowers the viscosity of the more viscous components of the menses allowing greater

fluid mobility and thereby obtaining greater utilization of the absorbent capacity. When exothermic or electrochemical reactants are used, the heating means 22 should generate enough heat to produce a temperature of from about 22°C to about 55°C. More preferably, the heating means 22 generates enough heat to produce a temperature of from about 27.5°C to about 46°C and most preferably , the heating means 22 generates enough heat to produce a temperature of from about 27.5°C to about 37°C.

Looking at the sanitary napkin 10 in greater detail, the sanitary napkin 10 is illustrated as having an oval shape, but is not limited thereto. The sanitary napkin 10 can have an hourglass, racetrack or any other shape or configuration that will allow the sanitary napkin 10 to come into intimate contact with the wearer.

The sanitary napkin 10 of the present invention may be any thickness and may cover periods for light to heavy flow and can have a thickness of a few millimeters to about 15 millimeters.

Referring to Fig. 3, the sanitary napkin 10 can further include one or more additional layers 24 that are designed to enhance, modify or transfer fluid in a preferential manner. Such layers include cellulosic and polymeric materials such as tissue, superabsorbents and melt blown materials. Such layers and materials are commercially available from several sources and are well known to those skill in construction of disposable absorbent articles, such as sanitary napkins, diapers and incontinent devices. The sanitary napkin 10 can also include shape conforming members adapted to contort and conform the sanitary napkin 10 to a wearer's anatomy during use.

The cover 12 is designed to contact the body of the wearer and therefore should be easily penetrated by body fluids. The cover 12 should also be non-irritating to the wearer's skin and preferably, will not absorb an appreciable amount of fluid insulting its surface. The cover 12 can be constructed of a woven or nonwoven, natural or synthetic material. Suitable materials include bonded carded webs of polyester, polypropylene, polyethylene, nylon, or other heat-bondable fibers. Other polyolefins, such as copolymers of polypropylene and polyethylene, linear low-density polyethylene, finely-perforated film webs and net material, also work well. Particularly preferred are composite materials of a polymer and a nonwoven fabric material. Still another cover material is a spunbond web of polypropylene. The web can contain about 1% to about 6% titanium dioxide pigment to give it a clean, white appearance. A uniform spunbond material is desirable because it has sufficient strength in the longitudinal direction, even after being perforated, to resist being torn or pulled apart during use. The most preferred

polypropylene webs have a basis weight of between about 10 and 40 grams per square meter. An optimum basis weight is between about 12 and about 30 grams per square meter.

To aid in the penetration of the liquid through the web, the cover 12 can also be treated with a surfactant to improve its hydrophilic characteristics. The surfactant can include topical additions or internally applied materials like polysiloxanes.

Positioned adjacent to the cover 12 is the absorbent 14. The materials used in the absorbent 14 are designed to absorb body exudates, including menstrual fluids, blood and urine. Suitable materials include wood pulp fluff, rayon, cotton and meltblown polymer, such as polyester, polypropylene or coform. Coform is an air-formed combination of meltblown polymers, such as polypropylene, and absorbent fibers. The absorbent 14 may be a composite comprised of a hydrophilic material that can be formed from various natural or synthetic fibers, wood pulp fibers, regenerated cellulose or cotton fibers, an airlaid tissue or a blend of pulp and other fibers. The absorbent 14 can be made from other well known materials used in absorbent articles, including multiple layers of cellulose wadding, cellulose sponge, hydrophilic synthetic sponge, such as polyurethane, and the like. The capacity of the absorbent 14 may be varied depending upon the intended usage of the final product.

The baffle 16 acts as a barrier between the absorbed body fluids contained in the absorbent 14 and the person wearing the sanitary napkin 10. Accordingly, the baffle 16 is nonabsorbent and impervious to liquids. The baffle 16 should be soft and compliant since a portion of the baffle 16 may reside adjacent the thigh region of the wearer. As used herein, the term "compliant" refers to materials which will readily conform to the general external shape and contours of the human anatomy. In a preferred embodiment, the baffle 16 may permit the passage of air or vapor out of the sanitary napkin 10 while blocking the passage of liquids from the absorbent 14. A good material for the baffle 16 is a micro-embossed, polymeric film, such as polyethylene or polypropylene having a thickness in the range of from about 0.012 mm to about 1.0 mm. Bicomponent films can also be used as well as woven and nonwoven fabrics which have been treated to render them liquid-impermeable.

Referring to Figs. 1 and 2, the heating means 22 is positioned beneath the cover 12 and intermediate the absorbent 14. The heating means 22 can include a chemical mixture enveloped in an appropriate air and moisture-permeable material 30. The material 30 can be a synthetic or natural, woven or nonwoven material. Desirably, the material 30 is capable of permitting air and moisture to pass while retaining the

particulate chemical mixture. Non-limiting examples of such materials 30 include a polyester nonwoven and a nonwoven spunbond polypropylene. Natural materials are also suitable for use in containing the chemical mixture. Cotton is an example of a natural material suitable for enveloping the chemical mixture.

The exothermic agents which can be utilized in the present invention may be a material which easily reacts with oxygen in the air, water from absorbed menses or both to generate heat at the time of reaction. When the heating means 22 generates heat by an exothermic reaction with oxygen, it is necessary that the reactants have an exchange of air. Although not particularly limited hereto, the reactants can be a mixture of an oxidizable substances such as iron, reduced iron, nickel, sodium sulfide and/or sodium sulfite; an oxidation accelerator and catalyst such as sodium chloride, calcium chloride, magnesium chloride, activated carbon, carbon powder and a mixture consisting of copper compound, manganese as well as a water retaining agent such as woodmeal or pulp powder. Other exothermic reactants are described in U.S. Patents 4,331,731 and 4,573,447 the entire disclosures of which are incorporated herein by reference.

For example, the chemical mixture of the heating means 22 can include an intermediate having 30 weight percent vermiculite, 55 weight percent of an aqueous solution having 10 weight percent sodium chloride and 15 weight percent carbon of fine particle size. The intermediate is combined with a fine iron powder at a ratio of about 1:1. Iron powder is preferred because it reacts readily with the oxygen in the air in the presence of moisture to generate heat. Moreover, the material is a good thermal conductor allowing for uniformity of temperature distribution and avoiding localized areas of sensible heat. The fineness of the powder can be varied to change the rate of the reaction and thereby the amount of heat generated. As a general rule, the greater the amount of metal powder, the hotter the reaction.

Sodium chloride is used to catalyze the oxidation of the iron. It is particularly desirable in that it is readily available and inexpensive. However, the sodium chloride can be replaced with other suitable chlorides and sulfates, such as potassium chloride, calcium chloride, magnesium chloride, ferric sulfate, potassium sulfate, sodium sulfate, and magnesium sulfate.

Those skilled in the art will understand that the ratios of the components, particle size, and ingredient quality of the chemical mixture can be varied substantially to make either a hotter or cooler reaction mixture.

When the heating means 22 used in the present invention is an electrochemical reaction that is activated by water, the electrochemical reaction generates heat by using

an electrochemically active reducible element and an electrochemically active oxidizable element. The reducible element can be formed from an air depolarized cathode on which another material such as oxygen is reduced. The oxidizable element can be a foil material made from aluminum or magnesium or an alloy of both. The reducible element and oxidizable element are separated by a water absorbing material such as felt. Preferably, an electrolyte forming salt is incorporated in a dry granulated form with or adjacent to the reducible element to thereby avoid the need to impregnate the water absorbing material. This allows the heating means 22 to have an extended storage life. Desirably, the electrolyte salt is applied uniformly into the cathode or reducible element. In the case of an air depolarized cathode using activated carbon or manganese dioxide, the table salt is originally uniformly dry mixed with the activated carbon or manganese dioxide in the range of about one to two an a half grams of salt to about one gram of carbon. Preferably, the ratio is from about one and a half grams of salt to one gram of carbon or manganese dioxide.

The heating means 22 may be composed of a material that will effectively distribute heat from the wearer's body in the absorbent 14. Desirably, such materials have a high thermal conductivity relative to the absorbent 14. Thermal conductivity of a substance is readily ascertainable using well known techniques.

Referring to Fig. 3, a transverse cross-section of an alternative embodiment of the invention is illustrated. The heating means 22 is positioned between the absorbent 14 and the baffle 16 so that the top of the heating means 22 is adjacent to the absorbent 14 and the bottom of the heating means is adjacent to the baffle 16. The heating means 22 is similar to that described above for Figs. 1 and 2, in that the chemical mixture comprising the heating means 22 is surrounded by an enveloping material 30.

Referring to Fig. 4, a transverse cross-section of an alternative embodiment of the invention is illustrated. The heating means 22 is positioned between the baffle 16 and a retaining layer 28 positioned below the baffle 16. The baffle 16 and retaining layer 28 are secured together to enclose the heating means 22. In this embodiment, although it is preferred for the chemical mixture to be enveloped in the material 30 it is not necessary. The retaining layer 28 can be composed of a material similar to the baffle 16. Desirably, the retaining layer 28 is composed of an air permeable material 30, such as spunbond, an apertured film and the like. The retaining layer 28 can include one or more apertures or perforations 32 that will enhance the exchange of oxygen irrespective of the air permeability of the retaining layer 28 composition. Desirably, the apertures or perforations 32 are positioned on the garment-facing surface of the retaining layer 28.

The apertures or perforations 32 should be appropriately sized so that the chemical mixture does not escape if an enveloping material 30 is not used but still permit the interchange of air through the material 30. Perforations 32 are necessary when the material 30 is impermeable to the exchange of air such as when a polyolefin film is used.

Perforations can be made in many different ways, including cutting, needling, punching and the like. In some cases the perforations 32 can be arranged in a narrow area or strip of the retaining layer 28 as opposed to having the perforations distributed throughout the retaining layer 28. By having the perforations 32 arranged along a narrow strip, it is possible to slow the dissipation of moisture through the material 30 and out of the chemical mixture. This can provide for a conservation of moisture within the chemical mixture, thereby increasing the life of the chemical mixture.

Referring to Fig. 5, a transverse cross-section of an alternative embodiment of the invention is illustrated. The chemical mixture of the heating means 22 can be randomly or evenly distributed or located in discrete identifiable pockets or areas similar to that described above for Figs. 1-4, but with lesser amounts of the chemical mixture contained in each pocket.

While the invention has been described with reference to several preferred embodiments and illustrated with regard to a range of optional features, those skilled in the art will appreciate that various substitutions, omissions, modifications, and changes may be made without departing from the spirit hereof. Accordingly, it is intended that the foregoing description be deemed exemplary of the preferred scope of the present invention and not deemed a limitation thereof.

I claim:

1. An absorbent article for absorbing body fluids comprising:
   a) a fluid permeable cover;
   b) a fluid-impermeable baffle;
   c) an absorbent enclosed between said cover and said baffle; and
   d) a heating means for heating said absorbent positioned adjacent to said absorbent.

2. The absorbent article of claim 1 wherein said heating means produces a temperature of about 22°C to about 55°C.

3. The absorbent article of claim 1 wherein said heating means produces a temperature of about 27.5°C to about 45°C.

4. The absorbent article of claim 1 wherein said heating means produces a temperature of about 27.5°C to about 36°C.

5. The absorbent article of claim 1 wherein said heating means is a chemical mixture distributed in said absorbent.

6. The absorbent article of claim 5 wherein said chemical mixture is distributed substantially uniformly throughout said absorbent.

7. The absorbent article of claim 1 wherein said heating means comprises a chemical mixture that reacts with oxygen to generate heat.

8. The absorbent article of claim 7 wherein said chemical mixture comprises a includes an oxidizable substance, an oxidation accelerator and a catalyst.

9. The absorbent article of claim 8 wherein said oxidizable substance includes iron.

10. The absorbent article of claim 1 wherein said heating means is an electrochemical heat cell.

11. The absorbent article of claim 10 wherein said electrochemical heat cell reacts with water in said body fluids to generate heat.

12. The absorbent article of claim 1 wherein said heating means has a higher thermal conductivity relative to said absorbent.

13. A sanitary napkin comprising

a) a fluid permeable cover;

b) a fluid-impermeable baffle;

c) an absorbent enclosed between said cover and said baffle; and

d) a heating means for heating said absorbent positioned adjacent to said absorbent.

14. The sanitary napkin of claim 13 wherein said heating means is positioned substantially intermediate said absorbent.

15. The sanitary napkin of claim 14 wherein said heating means is positioned between said absorbent and said baffle.

16. The sanitary napkin of claim 13 wherein said heating means is a chemical mixture distributed substantially uniformly throughout said absorbent.

17. The sanitary napkin of claim 16 wherein said chemical mixture reacts with oxygen to generate a temperature of about 22°C to about 55°C.

18. The sanitary napkin of claim 17 wherein said chemical mixture includes iron.

19. A sanitary napkin comprising

a) a fluid permeable cover;

b) a fluid-impermeable baffle;

c) an absorbent enclosed between said cover and said baffle;

d) a retaining layer at least partially secured to said baffle; and

e) a heating means for heating said absorbent enclosed between said baffle and said retaining layer.

20. The sanitary napkin of claim 19 wherein said retaining layer includes a perforation.

21. The sanitary napkin of claim 20 wherein said heating means comprises a chemical mixture having iron, wherein said chemical mixture reacts with oxygen to generate a temperature of about 22°C to about 55°C.

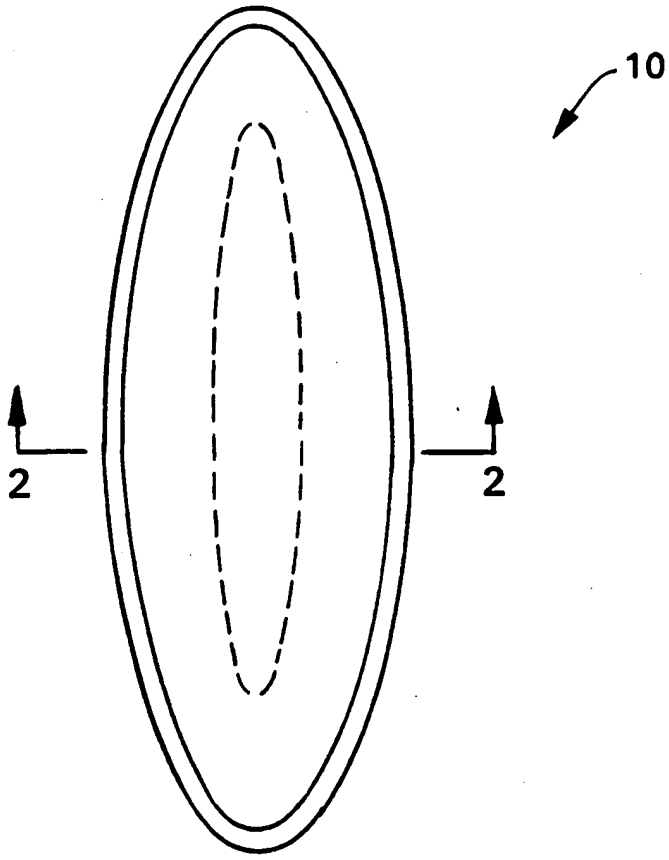

FIG. 1

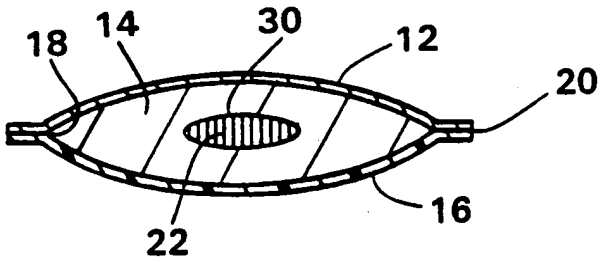

FIG. 2

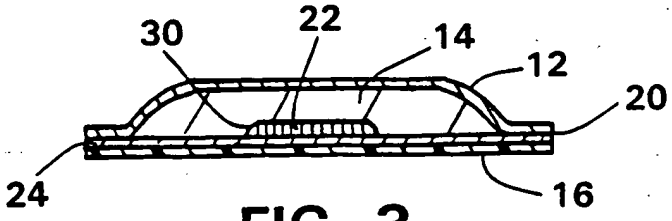

FIG. 3

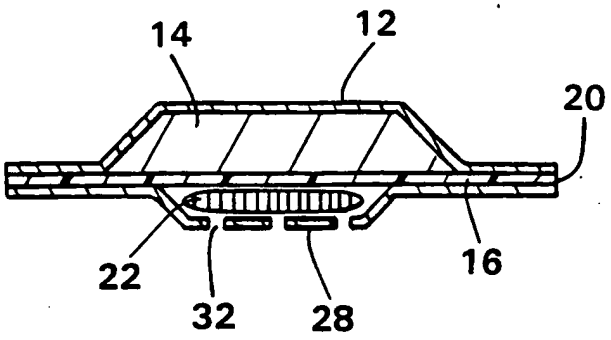

FIG. 4

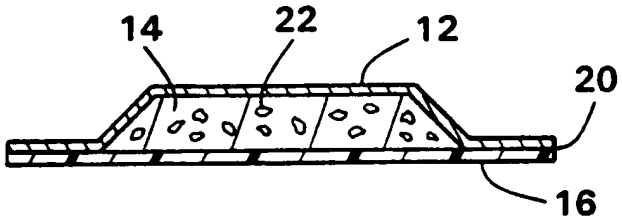

FIG. 5

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 97/24247

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61F13/15

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 178 139 A (ANGELILLO STEPHEN P ET AL) 12 January 1993 see claims; figures 1-6	1
Y		7-9
A		13,19

Y	US 2 573 791 A (HOWELLS J.N.M.) 6 November 1951 see column 2, line 9	7-9
A		1,15,21

X	US 5 167 655 A (MCCOY KEVIN) 1 December 1992 see column 3, line 24 - line 26; figures	1,13
A	see column 3, line 64 - line 66; claims 1,2,4,5; figures	2,19

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
29 April 1998	12/05/1998

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Ir. .ational Application No
PCT/US 97/24247

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication,where appropnate, of the relevant passages	Relevant to claim No.
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A	see page 5, line 11 - line 14	13,19
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1

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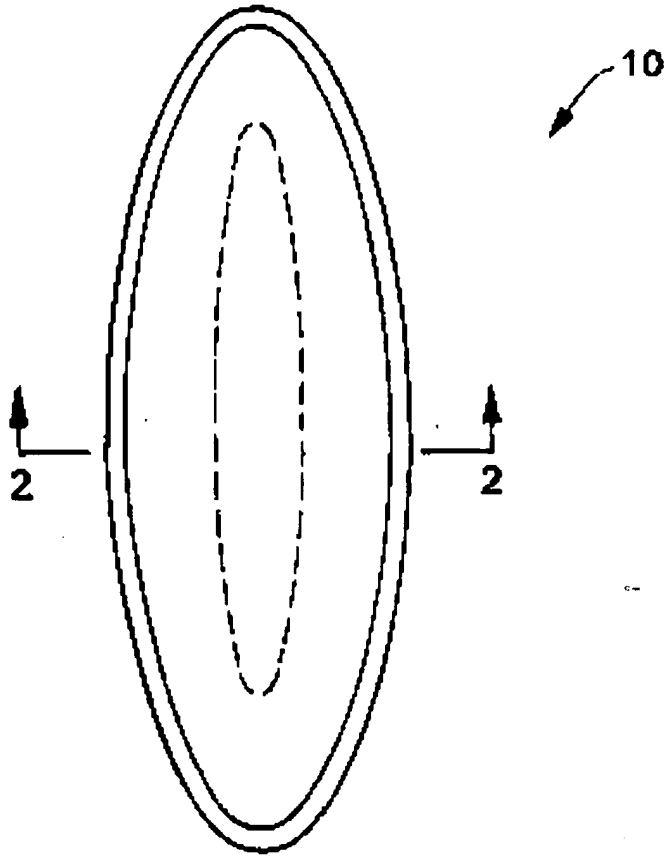

FIG. 1

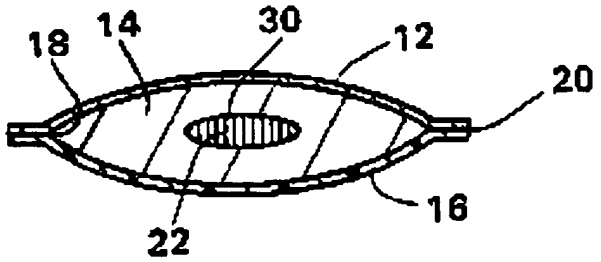

FIG. 2

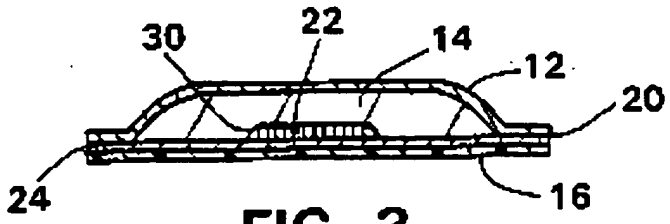

FIG. 3

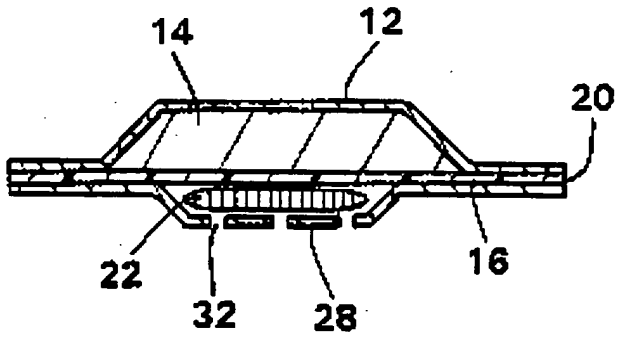

FIG. 4

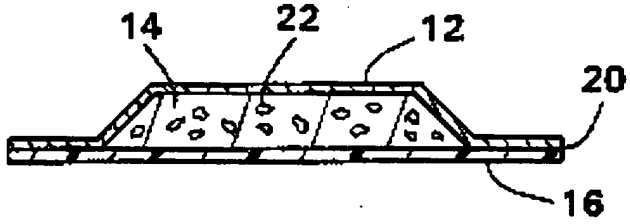

FIG. 5